United States
Environmental Protection
Agency

Office of Public Affairs
Region 5
77 West Jackson Blvd.
Chicago, IL 60604

Illinois Indiana
Michigan Minnesota
Ohio Wisconsin

PROPOSED PLAN

Marion (Bragg) Dump Site
Operable Units 2 and 3

Grant County, Indiana
June 1997

This Proposed Plan identifies the preferred option for the second and third operable units at the Marion (Bragg) Dump site (the Site). Operable Unit (OU) 2 consists of the groundwater and OU 3 consists of the on-site pond. This Proposed Plan is being issued by the U.S. Environmental Protection Agency (USEPA), the lead agency for site activities. USEPA, in consultation with the Indiana Department of Environmental Management (IDEM), will select a final remedy for the Site after the public comment period has ended and the information submitted during this period has been reviewed and considered.

USEPA is issuing this Proposed Plan as part of its public participation responsibilities under section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA) (commonly known as Superfund). This document summarizes information that can be found in greater detail in the remedial investigation (RI) and feasibility study (FS) reports issued in 1987, in the reports on the results of the monitoring of the Site that began during the remedial action, and in other documents contained in the administrative record for the Site. USEPA encourages the public to review these documents in order to gain a better understanding of the Site and the Superfund activities that have been conducted there. The administrative record file, which contains the information upon which the selection of the response action will be based, is available in the local repository at the Marion Public Library, 600 S Washington St., Marion, IN. This file is also available at the USEPA Records Center, 7th floor, 77 West Jackson Boulevard, Chicago, IL.

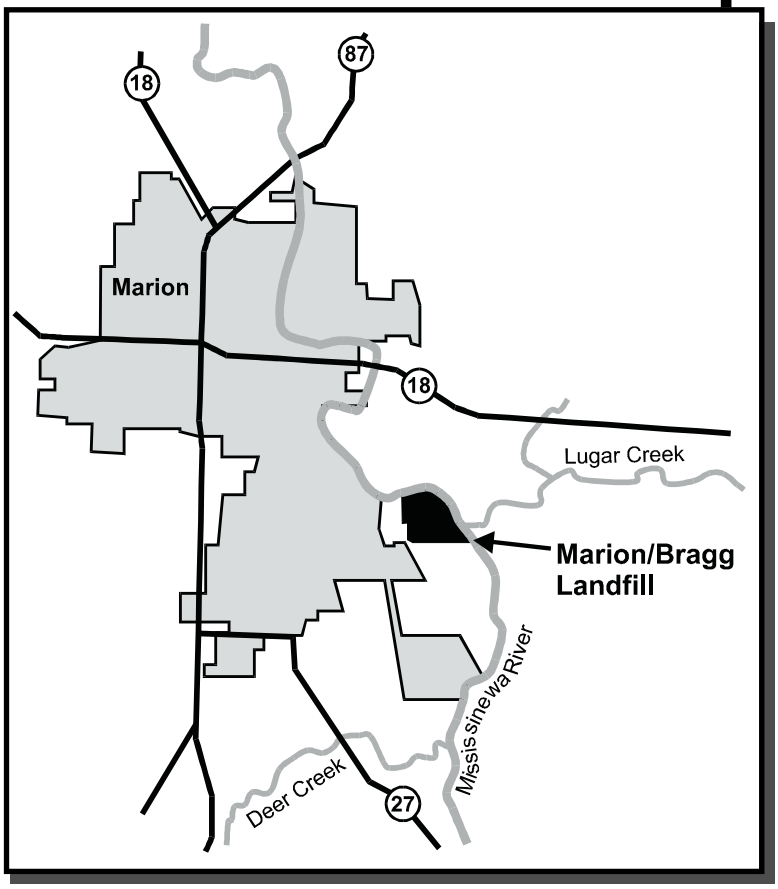
Public Comment Period

U.S. EPA will accept written comments on the Proposed Plan during a 30-day public comment period from June 27 through July 28, 1997.

Public Meeting

U.S. EPA will hold a public meeting to explain the Proposed Plan. Oral and written comments will be accepted at the meeting.

Date: Wednesday, July 16, 1997
Time: 7 to 9 p.m.
Place: Marion Public Library
600 S. Washington
Marion, Indiana



BACKGROUND

The Marion (Bragg) Dump site is located in Grant County, Indiana, just outside the southeastern city limits of Marion. The dump occupied approximately 45 acres of a 72-acre site along the bank of the Mississinewa River. The northern end of the Site is within the estimated 100-year flood plain.

The Site is bordered on the north and east by the Mississinewa River. A cemetery is located along the western border and private property is located along the Site's southern border. A residence and two businesses were located on the southwest corner of the Site. The two businesses, Marion Paving Company and Dobson Construction Company, are asphalt plants. A large (15 acre) pond formed from sand and gravel quarrying operations is in the center of the Site. The on-site pond was occasionally used for recreational purposes, such as boating and fishing. The on-site pond received discharges associated with air pollution control operations from the Marion Paving Company asphalt plant. A large pond of similar size is located off the Site, adjacent to the southern Site boundary.

The Site was used as a sand and gravel quarry from 1935 until approximately 1961. During the period from 1949 through 1970, Radio Corporation of America (RCA) leased and used portions of the Site for industrial refuse disposal. Concurrently, during the period from 1957 to 1975, Bragg Construction leased a separate portion of the Site which it used for disposal of municipal wastes. Periodic inspections by the Indiana State Board of Health (ISBH) indicated that operations at the dump were continually conducted in an unacceptable manner. ISBH specifically noted the disposal of hazardous or prohibited wastes including acetone, plasticizers, lacquer thinners, and enamels. Drummed wastes were allegedly emptied from the drums and "worked" into the other wastes with a bulldozer. Other typical violations included lack of daily cover, placing wastes in standing water (pond encroachment), and burning refuse. In 1975 Bragg Construction stopped operating the landfill. The landfill was covered with a sandy/silty material and seeded. The landfill was never formally closed through ISBH.

In 1975, Waste Reduction Systems, a division of Decatur Salvage, Inc., constructed a transfer station on the premises for transferring solid wastes to larger trucks before transporting them to a landfill. The transfer station was closed in 1977. In January 1980, ISBH issued a letter stating that the transfer station had been closed in an acceptable manner.

In September 1983 the Marion (Bragg) Dump was placed on the National Priorities List (NPL). A remedial investigation (RI) and a feasibility study (FS) were conducted by USEPA, and the reports for both were issued in July 1987. Following a public meeting and a public comment period on the FS report, USEPA issued a Record of Decision (ROD) on September 30, 1987 for an interim remedial action that addressed the surface soils and the on-site wastes.

The stratigraphy at the Marion/Bragg Landfill at the time of the RI consisted of landfill wastes (0-32 feet thick) over outwash deposits (6-64 feet thick), a glacial till (54 to 63 feet thick), and bedrock, the surface of which was 89 to 125 feet below ground surface.

It was estimated that the landfill contains approximately 1.1 million cubic yards of waste. At least 4 percent of this is perennially saturated in the upper aquifer. The saturated areas are to the east, west, and north of the pond. South of the pond, a water filled gravel pit was allegedly filled with demolition debris.

Outwash deposits (sands and gravel) constitute the upper aquifer, which also extends into the wastes. This unconfined water table aquifer is 18 to 42 feet thick. The average hydraulic conductivity was estimated as 4.27×10^{-2} cm/sec. The gradient in this aquifer is toward the Mississinewa River on both sides of the river. The Mississinewa River is a hydraulic barrier, causing the groundwater beneath the site to discharge to the river, without allowing flow to pass beyond the river. The Mississinewa River receives groundwater discharges from both sides of the river and upward from the bottom.

The on-site and off-site ponds are hydraulically connected to the groundwater. The presence of the on-site and the large off-site ponds creates a hydraulic anomaly in that water flows from the off-site pond, through the aquifer, and into the on-site pond from the south. The on-site pond discharges radially from the west, north and east sides of the pond. The predominant discharge area is to the north, to the Mississinewa River.

The outwash deposits are underlain by a very low permeability glacial till. This till is approximately 54 to 63 feet thick. The hydraulic conductivity ranges from 1.0×10^{-7} cm/sec to 2.88×10^{-8} cm/sec. This till layer is considered a confining unit.

The glacial till layer is underlain by limestone bedrock. The thickness of this layer is uncertain, but it was first encountered at 88 feet below ground surface. This bedrock layer constitutes a second aquifer. This confined aquifer has an upward vertical gradient, toward the glacial till.

During the remedial action (RA) that was performed primarily during 1990 and 1991, Marion Paving Company moved off the Site, and therefore its discharge to the on-site pond was eliminated; the residence located next to Marion Paving was torn down; common fill was placed in the waste disposal area to provide for proper surface water run-off; a compacted clay cap was installed in the waste disposal area to prevent air emissions, to prevent contact with the wastes, and to minimize infiltration of precipitation; the cap was covered with topsoil, which included matting in areas of possible exposure to 100-year floodwaters, and a vegetative layer was established to minimize erosion; rip-rap was installed along part of the river bank to the south to stabilize the bank in order to minimize possible exposure of wastes; a perimeter fence to minimize unauthorized access to the Site was installed; and, new monitoring wells on the Site were installed and the old ones were abandoned. The installation of the cover system modified the stratigraphy at the Site that was described above.

SCOPE AND ROLE OF THESE OPERABLE UNITS

In the ROD issued in 1987 at the conclusion of the feasibility study, USEPA identified three operable units: OU 1 was the surface soils and the on-site wastes; OU 2 was the groundwater; and OU 3 was the on-site pond. An interim remedy was selected only for OU 1. Selections of remedies for OU 2 and OU 3 were deferred until additional data concerning the risks associated with the discharge of the groundwater to the Mississinewa River and with the on-site pond could be obtained. Doing this permitted USEPA to immediately address the problems associated with possible contact with the contamination in the surface soils and the on-site wastes and the continual leaching of contamination from these areas into the groundwater and to obtain the added data on the groundwater, the river, and the on-site pond that was considered to be necessary in order to properly determine what, if anything, needed to be done regarding these issues.

The remedy selected in the 1987 ROD has been implemented. In addition to the actions described above, deed restrictions were obtained in the Consent Decree of April 1991 that protect the constructed elements of the remedy and prevent the future use of groundwater from the shallow aquifer on the Site. Also, monitoring of the groundwater, the on-site and the large off-site ponds, and the Mississinewa River have been carried out since the beginning of the on-site work in order to obtain additional data on the contamination in the on-site pond and on the effects of the discharge of the groundwater to the Mississinewa River.

SUMMARY OF THE RESULTS OF THE INVESTIGATIONS

Remedial Investigation

During the remedial investigation, the groundwater was investigated by sampling 4 off-site background monitoring wells, three of which were on the opposite side of the river and one of which was upgradient of the Site, 13 on-site monitoring wells, 2 on-site monitoring wells designated as leachate wells (which actually functioned as groundwater wells inside the waste boundaries), and 13 off-site water supply wells. The groundwater in the upper aquifer at the Site was found to contain organic and inorganic contaminants at concentrations above background levels; however, the number and concentrations of contaminants were relatively low. The organics that were found most frequently were benzene, trichloroethene, and bis(2-ethylhexyl)phthalate. Most of the heavy metals were detected only once in the groundwater at the Site; these detections were generally below the maximum contaminant levels (MCLs), which are presented here as points of reference, where available, but above the fresh water aquatic life criteria. Arsenic was an exception. Its concentrations were above the MCL in a few samples, and it was detected frequently at lower concentrations. In the public health evaluation done for the RI, in the scenario used that considered the groundwater at the Site as a possible drinking water source (the Site used as a recreational area), the maximum estimated excess lifetime cancer risk exceeded 10^{-4} due to arsenic. (The USEPA has established the carcinogenic risk range of 10^{-4} to 10^{-6} as the acceptable level for exposures to potentially carcinogenic substances.) Without arsenic, the maximum risk was estimated to be less than 10^{-6}. The hazard index for noncarcinogenic effects was less than one, the point at which there may be a level of concern for potential noncarcinogenic health effects. Other parameters for the groundwater that were at levels that might be of some concern were chemical oxygen demand (COD) and ammonia concentrations;

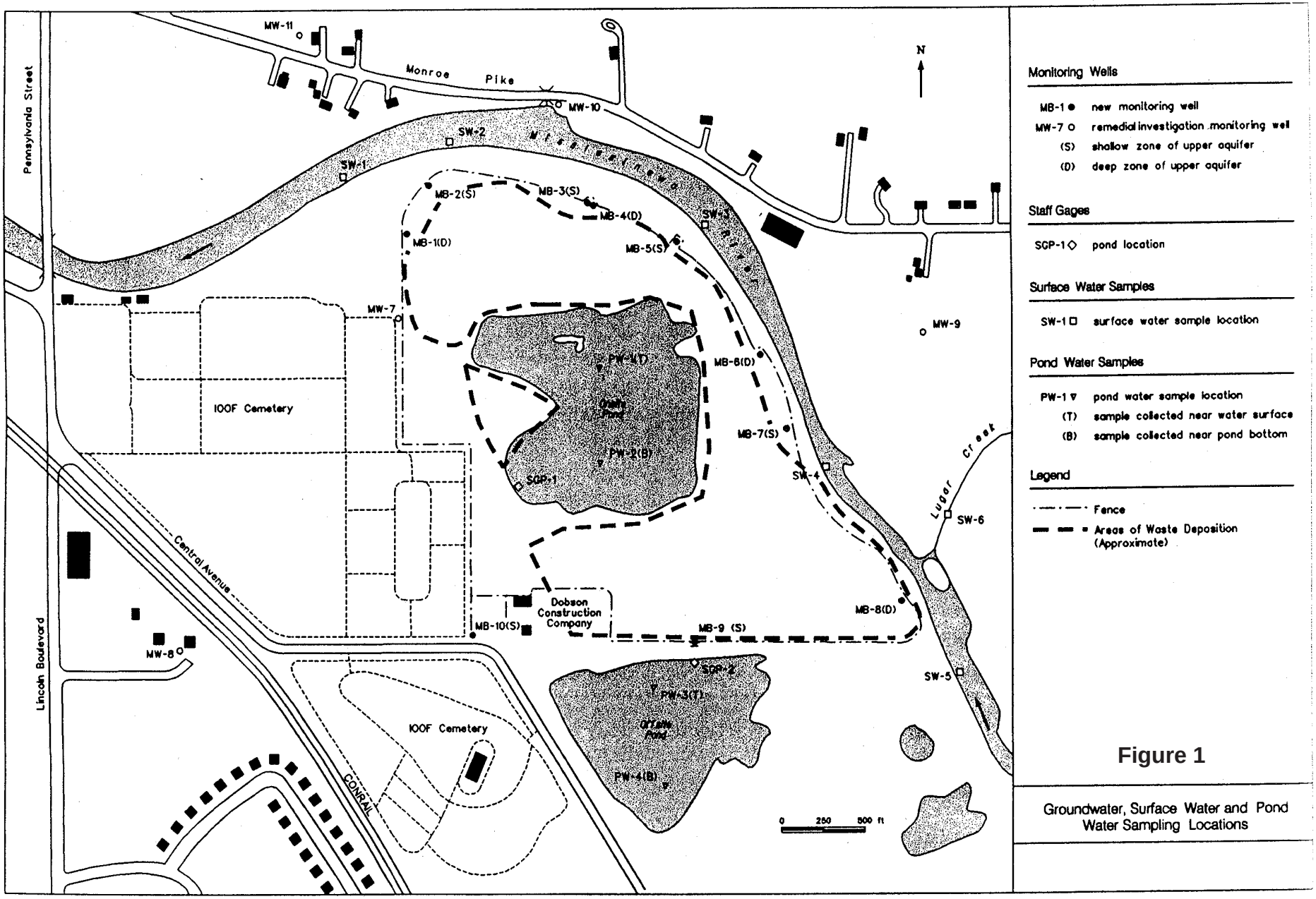


Figure 1

Groundwater, Surface Water and Pond Water Sampling Locations

there are no drinking water standards for these parameters.

Also during the RI the on-site and large off-site ponds and the river were sampled. (Background samples were also obtained from three small off-site ponds in the property south of the landfill.) The only sample from the on-site and large off-site ponds that exceeded water quality criteria was one that represented a leachate seep that discharged directly into the on-site pond. With the installation of the landfill cap, this leachate seep was eliminated. For the scenarios evaluated, the carcinogenic risks were not above the 10^{-6} point of departure and the hazard indexes were less than one. Pond sediments contained several inorganic constituents, phthalates, and low levels of polycyclic aromatic hydrocarbons (PAHs). Comparison of the sediment results to a database for inorganics from the Great Lakes Harbor sediments resulted in only the sediment location at the leachate seep being a location of concern. The river did not generally show signs of being impacted by the substances on the target compound list (TCL) and target analyte list (TAL), the lists of substances usually analyzed for at Superfund sites, during the time of the remedial investigation. Other water quality indicators were also analyzed for. The COD did not vary significantly between upstream, near-site, and downstream points. Ammonia was detected above water quality criteria in two samples, but both were taken in areas where the river flow at the time may have been impeded. No current human health risk was estimated for contact with the water in the Mississinewa River since only one sample with a slightly elevated sodium concentration was obtained. However, consideration of the amount of dilution that the river water provided for the groundwater discharge to the river indicated that under a low-flow situation there was a potential risk to the river due to arsenic and ammonia. Because of this, USEPA decided that more data was needed before making a recommendation for the ponds and the groundwater.

Monitoring

Many of the groundwater monitoring wells on the Site during the RI were installed through wastes. To eliminate the possibility of the groundwater being contaminated by the wastes in the immediate vicinity of the wells, these monitoring wells were abandoned during the remedial action and new ones were installed along the edge of wastes by the river. The locations of these wells are shown on Figure 1. One of the wells (MB-8) was installed through wastes since the edge of the wastes was very close to the river bank at this location, but special efforts were taken to minimize any effects from the wastes around the well. All the wells were installed in the upper aquifer, with some being installed at the water table (the shallow wells) and the others being installed near the bottom of this upper aquifer (the deep wells); at these wells the aquifer was in the neighborhood of 10 to 25 feet thick. Two background monitoring wells were also installed on the site. Because of the limitations regarding the locations that could be used, one (well MB-9) was installed very close to the wastes. Both of these wells were installed at the water table.

Beginning in February 1990, samples of groundwater, river water, and pond water have been collected and analyzed semiannually for the TCL and TAL substances and indicator parameters suggested by the state's landfill regulations. In the quarters following the semiannual sampling, samples of the groundwater are obtained and analyzed for the indicator parameters (total suspended solids (TSS), COD, ammonia, and chloride). Reports have been submitted to the USEPA and IDEM with the results of these samplings. Selected results for a few parameters are presented in Table 1 for river and pond samples and in Table 2 for groundwater samples for the first two semiannual sampling events, during which construction work at the Site was going on, and the last four semiannual sampling events. One point to note about the sampling results is that for a specific location the concentrations generally fluctuate with time, but in the case of the river, the concentrations sometimes change significantly all along the river from one sampling event to the next. The data for the downgradient groundwater wells and the on-site pond, which do show concentrations for many substances that are greater than the background concentrations, indicate generally a decrease in these concentrations with time.

In the groundwater samples taken from the new wells, volatile organic compounds (VOCs) are found in wells MB-1 and MB-2, the wells along the western boundary toward the north. Vinyl chloride, trichloroethene, total 1,2-dichloroethene, and benzene consistently have been detected in these wells. Arsenic concentrations have also been found at levels substantially above background in wells MB-2, MB-6, MB-7, and MB-8 and at lower levels in other wells. Well MB-6 has had the highest levels of arsenic, which have decreased since 1990. COD and sodium levels also

appear to have decreased in almost all of the downgradient wells since 1990. The ammonia levels appear to have decreased or remained essentially unchanged in the downgradient wells since 1990.

In the two ponds that are being monitored, ammonia, arsenic, and VOCs have generally not been detected. Chloride and sodium concentrations in the on-site pond are generally higher than those in the off-site pond; both have been decreasing. The sodium concentrations have been below the DWEL guidance level of 20,000 µg/l in the last four sampling events (DWEL is the drinking water equivalent level and is a lifetime exposure concentration that is considered protective of adverse, non-cancer health effects assuming all of the exposure to a contaminant is from a drinking water source).

In the sampling of the Mississinewa River and Lugar Creek, VOCs have not been detected and there have been only occasional detects of bis(2-ethylhexyl)phthalate, which may be a laboratory contaminant, at low concentrations. (The creek has been sampled so that if there are any unusual sampling results in the river, it can be determined if they might have been caused by something coming from the creek, which enters the river opposite the Site and downstream of the upstream monitoring point; the creek samples also provide background information.) Arsenic has not been detected in the river during the last four sampling events at detection levels as low as 2.3 µg/l. Ammonia generally has been a non-detect in the river; during the last four sampling events there was only one ammonia detection in the river. Except in the August 1990 sampling, there do not appear to be any trends in the COD concentrations in the river. Generally there do not appear to be any trends in the chloride and sodium concentrations in the river either, but there are a couple of instances when there have been indications of increases as one goes downstream; since this is not the usual case, it cannot be concluded that the sodium and chloride in the groundwater were the causes of the increases.

During the August 1990 sampling event, sediment samples were taken from the river and creek at the same locations that were used for water samples. No VOCs were reported for the sediment samples. Thirteen TCL semivolatile organic compounds (SVOCs) were detected in the 6 sediment samples, all at concentrations below the contract required quantitation limit levels that a laboratory must be able to routinely and reliability detect and quantitate; some of the detections were in samples from the two background locations. The detection frequencies ranged from 1 out of 4 to 4 out of 6. Bis(2-ethylhexyl)phthalate and di-n-butylphthalate were the most frequently detected SVOCs. A number of PAHs were detected in the sediment samples. The sample from location SW-3 contained the widest variety and highest concentrations of TCL SVOCs, a number of them being PAHs. However, PAHs were not identified in any of the groundwater, river water, or pond water samples during that sampling event or any other sampling event through February 1992, except for one detection in a background groundwater well. A number of TAL metals were detected in the sediment samples as one would expect. The arsenic, beryllium, cobalt, lead, and zinc concentrations were all estimated values (J-qualified concentrations, which means that there is some uncertainty in the reported concentration, but not in the identity of the chemical; the J qualifier is the most commonly encountered data qualifier in Superfund data packages, except, possibly, for the U qualifier which means the material was analyzed for but was not detected at the associated numerical value) below the contract required detection limits. Cyanide was not detected in any samples. The river sediment TAL metals concentrations appeared to be similar in samples collected from upstream, nearsite, and downstream sampling locations.

Additional Studies

In October 1989 the Central Regional Laboratory of Region 5 of USEPA conducted an instream biological assessment of the water quality in the Mississinewa River near the Site. USEPA's Standard Operating Procedures for conducting rapid assessments of fish using the ecoregion approach were used to evaluate the biotic integrity of the fish community based on Karr's index of biotic integrity. The study was conducted during normal flow conditions. Three stations were located in the river, one upstream, one opposite the Site, and one downstream, and two stations were located in Lugar Creek. Because of the poor biotic integrity of the river, the reference station was selected from a composite of "least impacted" stations of similar sized rivers from the Eastern Corn Belt Plain ecoregion. The Index of Biotic Integrity (IBI) was used to compare the different locations. For the river locations, the upstream and downstream stations had IBI ratings of "poor" and the nearsite station was rated "fair". In the report for the study, it was stated that no significant environmental impact was attributable to the Site.

Public Comment Sheet

Your input on US EPA's Proposed Plan for the Marion (Bragg) Dump Superfund site is important. Public comments assist US EPA in selecting its final cleanup plan.

You may use the space below to write your comments about US EPA's Proposed Plan. Comments must be postmarked by July 28, 1997. If you have questions about the comment period, contact Noemi Emeric at 312-886-0995 or 1-800-621-8431. Those with electronic communications capabilities may submit their comments to US EPA via Internet to: emeric.noemi@epamail.epa.gov

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Name:_____

Address:_____

City:_____

State:_____Zip:_____

Tear along dashed line and send your comments to U.S. EPA.

Marion (Bragg) Dump Superfund Site

Public Comment Sheet

Fold on Dashed Lines, Staple, Stamp, and Mail

Name_____

Address_____

City_____State_____

Zip_____

Place Stamp Here

Noemi Emeric (P-19J)
Community Involvement Coordinator
Office of Public Affairs
U.S. EPA, Region 5
77 West Jackson Boulevard
Chicago, IL 60604

DESCRIPTION OF THE "NO ACTION" PREFERRED ALTERNATIVE

As mentioned earlier, the Consent Decree that was negotiated for conducting the remedial design, remedial action, and operation and maintenance for OU 1 contained a deed restriction that includes prohibiting the installation of shallow drinking water wells on the Site. This is in the form of a covenant running with the land that is to be binding upon all persons who acquire any interest in the Site, and it was signed by the owners of the Site. The covenant and the restrictions under it were granted for the benefit of and shall be enforceable by the Marion-Bragg Generator Group, the group of defendants who performed the remedial action and remedial design and are performing the continuing Site sampling. The strip of land between the waste boundary and the river is part of this property and therefore drinking water wells are now prohibited there. This strip of land is narrow; in the southeast corner of the Site it consists only of the fairly steep river bank. Much of this strip of land lies within the 100-year floodplain. This strip of land is in a remote location with limited accessibility and would only be useful to someone making use of the rest of the Site. However there are restrictions on the use of the rest of the Site included in the covenant running with the land that bar any use of the land that may threaten the effectiveness, protectiveness, or integrity of the work that was performed during the remedial action. It is for these reasons that USEPA has determined that that limited portion of the shallow aquifer lying under the strip of land between the waste boundary and the river is not a future source of drinking water and consequently drinking water standards are not relevant and appropriate requirements for the Site. It must also be remembered that even though these site conditions preclude the use of the groundwater here, institutional controls have been implemented which prevent groundwater from this aquifer under both the waste management area and this narrow strip of land from being used.

The monitoring that has been performed since 1990 has not demonstrated any impacts on the water quality of the Mississinewa River. The two substances of primary concern in the groundwater that might adversely affect the river are arsenic and ammonia. Dissolved arsenic has not been detected in the river samples. The MCL and the acute and chronic aquatic criteria for arsenic are all significantly above the detection limit for arsenic. Ammonia has been detected very infrequently at low concentrations, but these detections might not necessarily be attributable to the groundwater from the Site. The one detection of ammonia in the river during the last four sampling events did result in a slight exceedance of the chronic aquatic criteria but the acute aquatic criteria was not exceeded.

Similarly, the monitoring has not demonstrated any problems with the water in the on-site pond. Arsenic, ammonia, and VOCs have generally not been detected, and the concentrations of sodium and chloride, which are indicators of contamination, have been decreasing. The reports on the water quality conditions for the last four semiannual samplings have not shown applicable water quality criteria being exceeded in the pond.

Consequently, the "no action" alternative is the preferred alternative for the Site for both OU 2 and OU 3. The groundwater at the Site poses no current or future risk to human health or the environment because: 1) contaminant levels have been low over most of the plume and are decreasing; 2) site-related contaminants have not been determined to have affected the concentrations in the adjacent Mississinewa River; 3) applicable water quality criteria have not been reported as being exceeded within the past two years in the on-site pond; 4) there are no current users of the groundwater at the Site; and, 5) future use of the groundwater at the Site is precluded by the conditions at the Site and by existing institutional controls. Since the future use of the land is as a landfill, there is no reason to assume that future wells may be drilled into the landfill to furnish a potable water supply, and there are institutional controls in place to maintain this restriction. Even if an action were selected to restore the groundwater for use as a potable water supply, the National Contingency Plan states that the cleanup levels established to do this would only have to be attained beyond the edge of the waste management area, not beneath the landfill wastes. In this alternative, no additional remedies will be carried out at the Site. However, monitoring of the groundwater, river water, and the on-site pond will continue for an indefinite period, although it will probably be reduced in extent from what has been done; it will be extensive enough and will continue long enough to ensure that contamination from the wastes is not detrimental to the river or the on-site pond. The remedy for OU 1 also requires monitoring the groundwater and the surface waters, and that remedy requires that the remedial work performed for its remedy be maintained.

COMMUNITY PARTICIPATION

USEPA encourages the public to comment on this preferred alternative for operable units No. 2 and No. 3 for the Marion (Bragg) Dump site and the data that has been presented in this Proposed Plan and in the documents in the administrative record. These comments will be evaluated before the final remedy is selected for the Site. For a complete description of the studies that have been undertaken for the Site, interested parties can review the administrative record and other documents that are available in the information repository that is located at:

Marion Public Library
600 S Washington St.
Marion, IN.

Written comments will be accepted during a public comment period from June 27 through July 28, 1997. Members of the community are encouraged to attend a public meeting on Wednesday July 16 at 7 p.m. at the Marion Public Library to discuss the Proposed Plan and the studies that have been conducted at the Site. Verbal comments may be made for the record during the meeting.

Comments received during the comment period and at the public meeting will be addressed in a Responsiveness Summary which will be included with the Record of Decision (ROD) and will be made public in the information repository after the ROD has been signed. To send written comments or obtain further information, both before and after the public meeting, please contact:

Noemi Emeric
Community Involvement Coordinator
Office of Public Affairs (P-19J)
312-886-0995

or

Bernard J. Schorle
Remedial Project Manager
Superfund Division (SR-6J)
312-886-4746

both at

U.S. Environmental Protection Agency
77 West Jackson Boulevard
Chicago, Illinois 60604

Agency representatives can also be contacted through the toll free number, 800-621-8431, between 9:00 am and 4:30 pm, central time.

Table 1. Selected Results, River (and Creek) and Ponds

µg/L = micrograms per liter mg/L = milligrams per liter

A. Results for February 1990

Substance	River (SW-5 is Upstream) and Creek (SW-6)						On-site Pond		Off-site Pond	
µg/l except as noted	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	PW-1	PW-2	PW-3	PW-4
benzene										
1,2-dichloroethene (total)							5U	5U	5U	5U
trichloroethene										
vinyl chloride										
bis(2-ethylhexyl)phthalate	10U	10U	10U	10U	10U	10U	10U	5J	10U	10U
arsenic (dis.)	3.9U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U
barium (dis.)	52.2J	67.6J	57.9J	59.6J	32.1J	22.1J	159J	173J	60.6J	61.2J
iron (dis.)	10.8J	20.1J	4.0U	4.0U	163	262	4.0U	18.5J	10.6J	7.9J
manganese (dis.)	23.9	31.0	16.1J	21.2	14.9J	133	8.7J	16.4	1.0U	1.0U
sodium (dis.)	10600	10400	12400	13900	11600	25400	32800	31100	10000	11600
ammonia-nitrogen, mg/l	1.0L	1.0L	1.0L	1.0L	1.0L	1.0L	1.0L	1.1	1.0L	1.0L
COD, mg/l	50L	50L	50L	50L	50L	50L	50L	50L	50L	50L
chloride, mg/l	27	27	28	29	28	47	28	29	16	15

B. Results for August 1990

Substance	River (SW-5 is Upstream) and Creek (SW-6)						On-site Pond		Off-site Pond	
µg/l except as noted	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	PW-1	PW-2	PW-3	PW-4
benzene										
1,2-dichloroethene (total)							5U	5U	5U	5U
trichloroethene										
vinyl chloride										
bis(2-ethylhexyl)phthalate	2J	3J	10U	4J	10U	10U	10U	10U	10U	10U
arsenic (dis.)	2.0U	2.9U	2.0UJ	2.7UJ	2.2UJ	2.0UJ	2.0U	2.0UJ	2.0UJ	2.0UJ
barium (dis.)	36.0J	35.6J	35.4J	34.8J	42.3J	33.2J	150J	148J	51.4J	70.3J
iron (dis.)	71.6J	77.0J	69.8J	45.6J	857	49.8J	16.1J	51.0J	13.3J	8.0J
manganese (dis.)	4.1J	5.0J	2.7J	1.0U	12.3J	5.0J	3.6J	4.6J	1.0U	4.0J
sodium (dis.)	5790	5700	5690	5630	5770	6540	33400	33200	10100	10300
ammonia-nitrogen, mg/l	0.41	0.5L	0.5L	0.5L	0.5L	0.5L	0.5L	0.5L	0.5L	0.5L
COD, mg/l	110	51	74	63	50	66	50L	50L	50L	50L
chloride, mg/l	15	10	15	20	15	20	26	28	15	15

C. Results for March 1995

Substance	River (SW-5 is Upstream) and Creek (SW-6)						On-site Pond		Off-site Pond	
µg/l except as noted	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	PW-1	PW-2	PW-3	PW-4
benzene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	10U	10U	10U	10U	10U	10U	10U	1J	10U	10U
trichloroethene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
vinyl chloride	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	10U	10U	10U	10U	10U	10U	10U	6J	10U
arsenic (dis.)	3.5U	3.5U	3.5U	3.6U	3.5U	3.5U	3.5U	3.5U	3.5U	3.5U
barium (dis.)	72.2	72.6	72.5	75.4	73.4	72.4	147	150	34.8	34.4
iron (dis.)	27.2U	27.2U	10.3U	27.2U	27.2U	27.2U	27.2U	27.2U	27.2U	27.2U
manganese (dis.)	11.4	11.4	7.6	11.2	11.2	12.7	1.0	2.9	0.4U	0.4U
sodium (dis.)	21100	21100	32500	20700	20500	20600	19100	19100	9940	9870
ammonia-nitrogen, mg/l	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
COD, mg/l	20U	20U	20U	R	20U	20U	20U	20U	20U	20U
chloride, mg/l	42	41	40	40	39	39	18	16	11	9.9

D. Results for September 1995

Substance	River (SW-5 is Upstream) and Creek (SW-6)						On-site Pond		Off-site Pond	
µg/l except as noted	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	PW-1	PW-2	PW-3	PW-4
benzene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
trichloroethene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
vinyl chloride	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	1J	10U	10U	4J	1J	10U	10U	2J	10U
arsenic (dis.)	2.7U	2.7U	2.7U	2.7U	2.7U	2.7U	2.7U	2.7U	3.9U	3.9J
barium (dis.)	93.0	80.4	75.1	83.2	75.7	69.0	114	109	50.9	50.9
iron (dis.)	9.7U	9.7U	10.3U	9.7U	9.7U	9.7U	9.7U	9.7U	34.7U	46.5U
manganese (dis.)	22.6	12.5	7.6	7.5	7.9	19.4	0.2U	0.78U	0.2U	0.48U
sodium (dis.)	38600J	34500	32500	33900	30900	21200	18600	18400	10800	11000
ammonia-nitrogen, mg/l	0.5U	2.0	0.5U	R	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
COD, mg/l	25	21	17	29	21	19	27	27	15	22
chloride, mg/l	60	60	57	55	53	34	19	19	14	14

E. Results for March 1996

Substance	River (SW-5 is Upstream) and Creek (SW-6)						On-site Pond		Off-site Pond	
µg/l except as noted	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	PW-1	PW-2	PW-3	PW-4
benzene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
trichloroethene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
vinyl chloride	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	1J	10UJ	10UJ	10UJ	10UJ	1J	10UJ	10U	10U	10U
arsenic (dis.)	3.0UJ	3.0UJ	3.0UJ	3.0UJ	3.0UJ	3.0UJ	3.0UJ	3.0UJ	3.0UJ	3.0UJ
barium (dis.)	42.6	41.5	44.7	44.4	40.7	45.3	152J	158J	42.7J	42.2
iron (dis.)	11.4U	10.9U	10.9U	10.9U	10.9U	10.9U	10.9U	10.9U	10.9U	10.9U
manganese (dis.)	6.1	6.1	6.4	7.8	5.8	53.4	0.67	2.3	0.23J	0.2U
sodium (dis.)	8760J	8710J	9180J	9300J	8350J	18500J	17500J	18100J	11400J	11400
ammonia-nitrogen, mg/l	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.19	0.22	0.1U	0.1U
COD, mg/l	10U	17.4	12.7	26.8	26.8	10U	18.2J	20.6J	10U	21.8U
chloride, mg/l	28.0	28.2	28.2	28.1	27.9	46.0	20.2	20.2	14.7	14.5

F. Results for September 1996

Substance	River (SW-5 is Upstream) and Creek (SW-6)						On-site Pond		Off-site Pond	
µg/l except as noted	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	PW-1	PW-2	PW-3	PW-4
benzene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
trichloroethene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
vinyl chloride	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
arsenic (dis.)	2.3U	2.3U	2.3U	2.3U	2.3U	2.3U	2.3U	2.3U	2.3U	2.3U
barium (dis.)	62.7	67.5	50.9	53.0	55.4	52.8	149	148	41.8	40.6
iron (dis.)	25.5U	25.5U	25.5U	25.5U	25.5U	25.5U	R	25.5U	25.5U	25.5U
manganese (dis.)	13.3	9.6	9.1	9.2	8.6	27.7	11.1J	9.9U	8.4	3.9U
sodium (dis.)	27900J	30600J	23300J	24900J	22900J	18100J	18700J	18800J	12500J	12400J
ammonia-nitrogen, mg/l	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U
COD, mg/l	14.7J	16.6J	11.9J	10UJ	14.4J	14.4J	19.2J	22.3J	12.8J	13.5J
chloride, mg/l	49.4	45.6	39.0	42.9	32.0	32.0	22.6	21.1	15.1	19.1

Notes: Blank spaces for 1990 data indicate the substance was analyzed for but was not detected. The sample quantitation or detection limit was not specified in the report.

Qualifiers: U means the material was analyzed for but was not detected above the level of the associated value, which is either the sample quantitation limit or the sample detection limit; L means the material was analyzed for but was not detected above the associated value, which is the sample detection limit; R means the data is unusable (the analyte may or may not be present) due to serious deficiencies; J means the associated value is an estimated quantity; N indicates the presence of the analyte that has been "tentatively identified".

"dis." means the dissolved portion; the sample was field filtered.

Table 2. Selected Results for Groundwater Monitoring Wells

A. Results for February 1990

Substance	Downgradient Groundwater Wells								Background	
µg/l except as noted	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10
benzene	5U	2J	5U	5U	5U	1J	5U	5U	5U	5U
1,2-dichloroethene (total)	140	5	5U	5U	5U	5U	5U	5U	5U	2J
trichloroethene	18	5U	5U	5U	5U	5U	5U	5U	5U	5U
vinyl chloride	22	12	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	10U	3J	10U	2J	2J	2J	8J	10U	2J
arsenic (dis.)	11.3	51.7	24.7	8.3J	3.0U	435	3.9J	114	3.0U	3.0U
barium (dis.)	193J	825	595	359	212	539	461	155J	44.3J	101J
iron (dis.)	2990	9070	4580	1840	13.4J	13100	274	4280	80.6J	26.7J
manganese (dis.)	671	1190	324	330	313	433	264	163	305	13.7J
sodium (dis.)	23400	43600	46200	40800	41600	118000	148000	134000	10500	16300
ammonia-nitrogen, mg/l	1.0L	16.0	7.1	1.0L	3.1	5.6	20.0	9.8	1.0L	1.0L
COD, mg/l	56	170	230	160	140	250	160	320	300	50L
chloride, mg/l	25	40	30	30	30	67	70	36	15	40

B. Results for August 1990

Substance	Downgradient Groundwater Wells								Background	
µg/l except as noted	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10
benzene	5U	5	5U	5U	5U	2J	5U	5U	5U	5U
1,2-dichloroethene (total)	57	21	5U	5U	5U	1J	5U	5U	5U	5U
trichloroethene	73	5U	5U	5U	5U	5U	5U	5U	5U	5U
vinyl chloride	4J	47	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	6J	3J	10U	10U	10U	3J	15	7J	10U	10U
arsenic (dis.)	12.2U	71.0	15.9J	18.9J	2.1J	420	79.6	127	4.4UJ	2.0U
barium (dis.)	177J	876	817	596	439	444	698	284	68.7J	96.5J
iron (dis.)	2700	15400	9180J	4280J	14.5J	13100	8270	5320	389	22.8J
manganese (dis.)	683	157	165	161	505	98.0	142	69.5	783	6.6J
sodium (dis.)	17700	34500	33400	33600	32500	76700	100000	200000	10800	11400
ammonia-nitrogen, mg/l	0.5L	12.0	8.5	2.0	2.5	11.0	12.0	3.5	0.6	0.5L
COD, mg/l	50L	60	120	54	60	200	170	200	120	50L
chloride, mg/l	24	31	34	35	31	49	56	57	15	22

C. Results for March 1995

Substance	Downgradient Groundwater Wells								Background	
µg/l except as noted	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10
benzene	10U	2J	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	95	1NJ	10U	10U	10U	10U	10U	10U	10U	10U
trichloroethene	38	10U	10U	10U	10U	10U	10U	10U	10U	10U
vinyl chloride	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
arsenic (dis.)	10.4J	133	36.6	21.6J	12.8J	214	91.2	124	8.9	3.5U
barium (dis.)	153	579	724	452J	385	352	542	148	70.8	99.6
iron (dis.)	1730	22000	13100	3610	2450	16800	7550	4490	1730	27.2U
manganese (dis.)	679	304	190	189	471	73.6	60.4	59.0	602	0.4U
sodium (dis.)	17700J	25400J	21400J	20200J	22200J	29500J	44800J	61100J	9560J	20500J
ammonia-nitrogen, mg/l	0.5U	6.9	3.4	1.4	0.5U	3.9	5.2	0.5U	0.5U	0.5U
COD, mg/l	20U	20U	20U	20U	20U	33	20U	95	41	20U
chloride, mg/l	22	20	18	20	19	21	21	39	3	31

D. Results for September 1995

Substance	Downgradient Groundwater Wells								Background	
µg/l except as noted	MB-1	MB-2	MB-3	NB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10
benzene	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	110	10U	10U	10U	10U	10U	10U	10U	10U	10U
trichloroethene	36	10U	10U	10U	10U	10U	10U	10U	10U	10U
vinyl chloride	5J	10U	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	10U	10U	R	3J	10U	4J	3J	1J	4J
arsenic (dis.)	7.7	91.9	27.7	16.5	173	16.9	120	120	5.6	2.7U
barium (dis.)	139	517	571	439	313	R	551	157	73.5	136
iron (dis.)	1710	14000	9400	3760	63.4	4170	9520	4880	1570	9.7U
manganese (dis.)	648	125	147	189	R	R	41.6	55.2	540	0.2U
sodium (dis.)	16000J	22100J	19500	19200	R	18400	38400	62500	8710	17700
ammonia-nitrogen, mg/l	0.5U	8.4	5.3	2.0U	3.2	3.9	6.4	1.4U	0.7U	0.5U
COD, mg/l	9.7	53	21	9.7	17	29	23	84	36	9
chloride, mg/l	22	23	18	18	17	21	22	17	13	29

E. Results for March 1996

Substance	Downgradient Groundwater Wells								Background	
µg/l except as noted	MB-1	MB-2	MB-3	NB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10
benzene	10U	1J	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	170J	2J	10U	10U	10U	10U	10U	10U	10U	10U
trichloroethene	27J	10U	10U	10U	10U	10U	10U	10U	10U	10U
vinyl chloride	20J	10U	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	10U	3J	1J	1J	10U	2J	2J	1J	0.7J
arsenic (dis.)	6.4J	51.2	25.1	15.5	3.0U	185	34.4	121	5.2J	3.0U
barium (dis.)	171J	426	R	470J	291J	376J	520J	200J	70.9	99.1J
iron (dis.)	2020	7560	8600J	3490	199	15800	3510	6600	2100	10.9U
manganese (dis.)	771J	255	R	191	443	69.1	38.4	75.1	542	0.2U
sodium (dis.)	19500J	24400	21100	20100	22000	32500J	35400	73400J	10300	18300
ammonia-nitrogen, mg/l	0.1U	7.6	4.6	2.0	1.0	4.6	3.9	3.1	0.41	2.0
COD, mg/l	10U	40.6	10U	12U	10U	30.0	16.2	50.0	10U	10U
chloride, mg/l	30.1	22.8	21.6	21.9	20.7	24.6	20.9	25.1	14.0	22.0

F. Results for September 1996

Substance	Downgradient Groundwater Wells								Background	
µg/l except as noted	MB-1	MB-2	MB-3	NB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10
benzene	10U	2J	10U	10U	10U	10U	10U	10U	10U	10U
1,2-dichloroethene (total)	84	10U	10U	10U	10U	10U	10U	10U	10U	10U
trichloroethene	38	10U	10U	10U	10U	10U	10U	10U	10U	10U
vinyl chloride	10U	1J	10U	10U	10U	10U	10U	10U	10U	10U
bis(2-ethylhexyl)phthalate	10U	10U	10UJ	10U	10U	10U	10U	10U	2J	10U
arsenic (dis.)	9.1J	8.4	29.3	16.3	10.3	162	110	99.2	7.9	2.3U
barium (dis.)	139J	135	583	479	479	330	617	263	69.0	97.0
iron (dis.)	1890J	1890	10500	3550	3130	13300	12600	6590	2350	25.5U
manganese (dis.)	418J	R	188	217	444	60.5	61.7	95.0	575	1.3U
sodium (dis.)	16000J	15800	21000	20300	20400	30000	40900	94400	10700	15700
ammonia-nitrogen, mg/l	0.1U	11.0	5.5	1.8	3.0	4.9	5.0	3.3	0.45	0.1U
COD, mg/l	10UJ	28.3J	12.8J	10.9J	10.3J	12.2J	21.1J	62.2J	10UJ	10UJ
chloride, mg/l	23.6	26.3	22.3	22.6	21.1	22.4	29.5	24.8	14.4	28.8

Notes: Qualifiers: U means the material was analyzed for but was not detected above the level of the associated value, which is either the sample quantitation limit or the sample detection limit; L means the material was analyzed for but was not detected above the associated value, which is the sample detection limit; R means the data is unusable (the analyte may or may not be present) due to serious deficiencies; J means the associated value is an estimated quantity; N indicates the presence of the analyte that has been "tentatively identified".

"dis." means the dissolved portion; the sample was field filtered.

Samples for wells MB-5 and MB-6 may have been switched in September 1995.

Additional Information

If you have questions about the information in this fact sheet or would like additional information about the Marion (Bragg) Dump Proposed Plan, please write or call the individuals listed below.

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The Proposed Plan, Community Involvement Plan, fact sheets, and other site-related information are available for review in the **site information repository** at the **Marion Public Library**, 600 S. Washington Street, Marion. An **Administrative Record** file, which contains the information upon which the selection of the cleanup plan will be based, has also been established at the **Marion Public Library**.

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